IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

POLAROID CORPORATION, Plaintiff and Counterclaim Defendant, v. HEWLETT-PACKARD COMPANY, Defendant and Counterclaim Plaintiff.	C.A. No. 06-738-SLR **REDACTED**

DEFENDANT HEWLETT-PACKARD COMPANY'S MEMORANDUM IN SUPPORT OF ITS MOTION FOR SUMMARY JUDGMENT OF NON-INFRINGEMENT, OR, IN THE ALTERNATIVE, PATENT INVALIDITY

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I. NATURE AND STAGE OF THE PROCEEDING

This is a patent infringement case. Plaintiff, Polaroid Corporation ("Polaroid"), alleges that defendant, Hewlett-Packard Company ("HP"), infringes U.S. Patent No. 4,829,381 (the "'381 patent"). Fact and expert discovery have been completed. Claim construction has been briefed. This memorandum is filed by HP in support of its Motion For Summary Judgment Of Non-Infringement, Or, In The Alternative, Patent Invalidity.

II. SUMMARY OF ARGUMENT

Polaroid's '381 patent is directed to the enhancement of digital images by the use of a specific algorithm and device. During prosecution, Polaroid's claims were rejected as obvious in view of a particular prior art reference. In order to obtain allowance, Polaroid added a limitation to each asserted claim of the patent. The added limitation requires the use of a specific ratio. In the present case, Polaroid asserts an infringement theory that would vitiate that limitation.

As will be demonstrated below, under both parties' proposed claim constructions, applying ordinary claim construction principles, and under any construction that avoids the prior art cited by the Examiner, HP does not infringe. HP's accused software does not incorporate any ratio, much less the ratio required by the added claim limitation. Moreover, if the asserted claims could somehow be said to cover HP's accused technology -- if the ratio limitation were effectively eliminated from these claims -- the asserted claims would be invalid because they could no longer be distinguished from the prior art cited by the Examiner.

In addition, certain asserted claims of the '381 patent are in means plus function form. HP's accused software algorithm does not perform the function, or employ the means, claimed in the '381 patent.

III. STATEMENT OF UNDISPUTED FACTS

A. Background

1. When the human eye takes in a scene, the brain is capable of distinguishing a very large number and wide range of degrees of luminance (brightness) in the scene. A digital camera is different. When a digital camera captures the same scene, its ability to reproduce degrees of luminance -- its "dynamic range" -- is limited. This is because digital imaging devices use binary code. In a hypothetical, one-bit system, a single "1" and a single "0" would be available to express differences in luminance (brightness). In a two-bit system, four levels of luminance may be reproduced (using the combinations 00, 01, 10, and 11). In the eight-bit systems that are typical of digital imaging devices, 256 degrees of brightness may be expressed by the system. Both the '381 patent and HP's accused software operate in an eight-bit environment.

2. A shortcoming of digital imaging systems is that the number of luminance levels that are available to reproduce an image is significantly smaller than the number of levels of brightness that are in the actual scene being depicted. As a result, differences in level of brightness -- the contrast within -- a very bright portion of an image, or a very dark portion of an image, may be lost when an image is digitally reproduced. Details in very bright or very dark regions that are perceptible to the human eye in the original scene will become undetectable in the digital image. The '381 patent is addressed to this problem. *See* '381 patent, filed herewith as Exhibit A to the Declaration of William J. Marsden, Jr.("Marsden Decl."), 1:26-35.[1]

[1] *Id.*, 1:26-35: "Difficulties arise, however, as a result of differences between the wide dynamic range of the scene originally sensed and recorded and the substantially smaller dynamic range to which a photographic print may be exposed. The wide dynamic range of luminance intensities within the scene originally recorded may thus be compressed or clipped to the substantially smaller dynamic range of the photographic print, losing detail within certain portions of the dynamic range that were otherwise visible in the original scene."

3. A digital image is captured by a device that separately examines, and senses the brightness of, a large number of individual locations in a scene. These locations are organized by the device into a set of horizontal rows and vertical columns. Each location in this grid is called a "picture element," or "pixel." *Id.*, 3:13-20.

4. As described in the '381 patent, an image capture device receives scene light at each location in the grid, and, for each pixel, converts the amount of luminance (brightness) into a digital value, an eight-bit binary number ranging from 0 (expressed as 00000000) to 255 (expressed as 11111111). Typically, 0 is black and 255 is extremely bright. *Id.*, 3:43-49 ("the analog luminance electronic information signal values for each pixel … are digitized to an 8-bit binary number so as to have a dynamic integer range of from 0 - 255 within which range are 256 intensity levels ….").[2] This conversion process is "conventional." *Id.*, 3:49-52.

B. <u>The '381 Patent</u>

5. The '381 patent states that the purpose of the described "invention" is to increase the contrast among pixels in the darkest and brightest areas of a digital image so that it is possible to see increased detail in those portions of the image. *Id.*, 2:54-62. This objective is allegedly achieved by the use of the "system and method" described in the patent. *Id.*, Abstract.

6. According to the patent, pixels are processed one after another in a continuous stream. *Id.*, 1:66-2:1. The process of converting a digital input value for a pixel into a different output value is called "transformation." The '381 patent describes a *particular* apparatus that uses a *particular* algorithm to transform luminance (brightness) values for pixels that together provide an image. In the '381 patent, luminance is expressed by use of the symbol "Y." The

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[2] The '381 patent states that, for a color image, luminance values may be captured at each pixel for each of the colors red, green, and blue (from which all other colors may be constructed). These red, green, and blue values are then given particular weights so as to compute a luminance value for that pixel. *Id.*, 3:36-43.

luminance value of a pixel, as originally captured in digital form, is expressed as "Y_{in}." The luminance value of that pixel after transformation is expressed as "Y_{out}." *Id.*, 4:60-5:3.

7. In a first step, a device (described, *infra*, at p.3) determines the average luminance value for a group of pixels located in the neighborhood (the local area in an image) of the particular pixel whose luminance value is to be transformed. *Id.*, 3:59-4:5. This averaging process is said by the '381 patent to be "well known ... in the electronic arts." *Id.*, 4:22-25. The average value for the neighborhood of pixels is represented by the symbol "Av."

8. In a second step, the average luminance value of this group of pixels is provided to a device (described below) that calculates a value called "gamma." Gamma is represented as "γ." Gamma is then used in a further calculation (a third step) to transform the input luminance value for a pixel into an output luminance value.

9. Gamma (γ) is determined according to the formula:

$$\gamma = (1 + C)^{\left(\frac{Av}{M} - 1\right)}$$

id., 4:32. In this formula, "C" is a "control parameter" that is used, as explained below (para. 19), to increase or decrease the amount of image "enhancement" that is provided by the system of the patent. *Id.*, 4:51-55. "Av" is, as noted above, the average luminance value for the group of pixels surrounding, and including, the pixel to be transformed. *Id.*, 4:26-30. According to the written description, "M" may be any value in the dynamic range -- *i.e.*, it may be any of the integers 0 through 255. The purpose of M, and the reason why the user would select any particular value for M, is described below in paragraph 20. In an example used in the patent, M is 128, an integer value that is adjacent to the mid-point of the range 0-255. *Id.*, 4:36-39.

10. Thus, generalizing, γ equals (1 + C) -- a number greater than 1, which is raised to a power. The exponent $\left(\frac{Av}{M} - 1\right)$ will be a positive number when the local average luminance

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value (Av) is greater than M -- *i.e.*, when the average luminance value of the neighborhood is brighter than the luminance value selected for M. The exponent will be a negative number if the local average (Av) is less than M -- *i.e.*, if brightness in the pixel neighborhood is less than the brightness represented by whatever value is selected for M.

11. We pause here to recall mathematical principles learned in high school. A number that is greater than 1 (*e.g.*, 2), raised to a positive power, will be a number greater than 1 (*e.g.*, $2^2 = 4$). A number that is greater than 1 (*e.g.*, 2), if raised to a negative power (*e.g.*, 2^{-1}), will be a fraction, the numerator of which is 1 and the denominator of which is the same number raised to a positive power that mirrors the negative power. For example, 2^{-1} is $\frac{1}{2^1}$ or $\frac{1}{2}$. Lee E. Yunker, *et al.*, Advanced Mathematical Concepts 264 (Charles E. Merrill Publishing Co. 1981) (Marsden Decl., Ex. B).

12. Thus, in the formula for gamma, the base (1 + C) will be greater than 1. The exponent will be a positive number in the bright areas of an image and will be a negative number in the dark portions of the image. As a result, gamma (γ) will a number greater than 1 in the bright areas of an image -- (1 + C) raised to a positive power -- and γ will be a fractional value in the dark areas of the image -- (1 + C) to a negative power.

13. In the third step described in the '381 patent, gamma, calculated as described above, is used in the transformation of the luminance input value, Y_{in}, to the luminance output value, Y_{out}. The patent discloses the formula:

$$Y_{out} = Y_{MAX}\left(\frac{Y_{in}}{Y_{MAX}}\right)^{\gamma}$$

Id., 4:64. In this formula, Y_{MAX} is 255, the highest value of the dynamic range (the range of integer values that are available to express a luminance value). *Id.*, 4:66-68. Thus:

$$Y_{out} = 255\left(\frac{Y_{in}}{255}\right)^{\gamma}$$

$\frac{Y_{in}}{255}$ will almost always be a fraction whose value is less than 1 because Y_{in} will be less bright (will be a lower number) than the maximum brightness level. As explained above, this fraction is then raised to a power (γ) that will be a number greater than 1 in the relatively bright areas of an image, and will be a fraction in relatively dark areas of that image.

14. Recall from high school mathematics that when a fraction $\left(\frac{Y_{in}}{Y_{MAX}}\right)$ is raised to a power greater than one, the result will be a smaller fraction (*e.g.*, $\left(\frac{1}{2}\right)^2 = \frac{1}{2} x \frac{1}{2} = \frac{1}{4}$). A fraction raised to a fractional power results in a larger fraction (*e.g.*, $\left(\frac{1}{2}\right)^{\frac{1}{2}} = \frac{1}{\sqrt{2}} = \frac{1}{1.414}$).

15. Thus, when the formula disclosed in the '381 patent is used in bright areas of an image, a single pixel value (Y_{in}) is placed in a fraction $\frac{Y_{in}}{255}$. This fraction is raised to a positive power to produce Y_{out}. Because a fraction raised to a positive power will be a smaller number, Y_{out} will be lower than Y_{in} -- the luminance value of the pixel will be made lower (darker). The contrast between the now darker pixel and its bright pixel neighborhood will be increased.

16. Conversely, in a dark area, the fraction $\left(\frac{Y_{in}}{Y_{MAX}}\right)$ will be raised to a fractional power. Because a fraction raised to a fractional power will be a larger number, a single pixel in a dark area of an image will have its luminance value increased (it will be brighter). The contrast between that pixel and its (dark) surrounding pixels will increase.

17. The way the disclosed formula works may be illustrated by using three sample values for the luminance value of a neighborhood of pixels: values for (a) a neighborhood that is neither bright nor dark, (b) a bright neighborhood, and (c) a dark neighborhood. For the purposes of these examples, C will be set to be 1 (the example used in the patent, 5:28). Therefore, in the calculation of gamma, 1 + C will equal 2.

(a) <u>A mid-range neighborhood</u>. Assume that the average luminance values for the neighborhood of the subject pixel is 128. This is a value very close to the middle of the dynamic range 0-255. It is an area that is neither very light nor very dark. Luminance values in this area are not changed. According to the '381 patent, gamma is obtained by the formula:

$$\gamma = (1 + C)^{\left(\frac{Av}{M} - 1\right)}$$

As noted, Av, the average luminance value for the pixel neighborhood, is 128. M is any integer value within the available dynamic range that the user selects. In the example used in the patent, 128, a number near the middle of the range, is selected. On these assumptions, applying the formula

$$\gamma = (1 + C)^{\left(\frac{Av}{M} - 1\right)}$$

when the base (1 + C) is (1 + 1) or 2, then

$$\gamma = 2^{\left(\frac{Av}{M} - 1\right)}$$

Because Av (the luminance of the pixel neighborhood) is 128, and M is chosen to be 128,

$$\gamma = 2^{\left(\frac{128}{128} - 1\right)}$$

and, therefore,

$$\gamma = 2^{0} \; or \; 1$$

When a gamma of 1 is then applied to the equation

$$Y_{out} = Y_{MAX}\left(\frac{Y_{in}}{Y_{MAX}}\right)^{\gamma}$$

the following result is obtained:

$$Y_{out} = 255\left(\frac{Y_{in}}{255}\right)^{1}$$

$$Y_{out} = 255\left(\frac{Y_{in}}{255}\right)$$

$$Y_{out} = Y_{in}$$

Thus, there is no change in luminance values, where, as in this example, the relevant area of the image is neither at the bright nor the dark end of the dynamic range.

(b) A bright neighborhood. Assume that the average luminance values of the pixel neighborhood (Av) is very high -- the area is very bright -- and increased contrast within the area is desired. In this situation (again, C = 1 and (1 + C) = 2):

$$\gamma = 2^{\left(\frac{Av}{M} - 1\right)}$$

If the average luminance value in the very bright pixel neighborhood is, for example, 254, then Av will be 254. If M is again set near the mid-point of the dynamic range, then:

$$\gamma = 2^{\left(\frac{254}{128} - 1\right)}$$

$\frac{254}{128} - 1$ is a value that is slightly less than one. To simplify, it is assumed to be 1 in the illustration below. On this assumption:

$$\gamma = 2^{(2-1)}$$

$$\gamma = 2^{1}$$

$$\gamma = 2$$

According to the '381 patent, γ is then applied in the formula:

$$Y_{out} = Y_{MAX}\left(\frac{Y_{in}}{Y_{MAX}}\right)^{\gamma}$$

Y_{MAX} is 255. Therefore,

$$Y_{out} = 255\left(\frac{Y_{in}}{255}\right)^{\gamma}$$

In this bright neighborhood example, γ is 2. Therefore,

$$Y_{out} = 255\left(\frac{Y_{in}}{255}\right)^{2}$$

Assuming that the pixel whose value is to be transformed had a Y_{in} -- an initial luminance value -- of 250 (*i.e.*, it was bright but not quite as bright as the very bright neighborhood), then

$$Y_{out} = 255\left(\frac{250}{255}\right)^{2}$$

Any fraction, when squared, will result in a smaller fraction. In this example:

$$Y_{out} = 255\left(\frac{250}{255} \times \frac{250}{255}\right) = \frac{62{,}500}{65{,}025} = \left(\sim\frac{245}{255}\right)$$

Thus, the subject pixel is made less bright. Its luminance value is lowered from 250 to 245. Now, the difference between its luminance value and the neighborhood average luminance value (assumed to be 254) is increased. As a result, the contrast between the relevant pixel as transformed (Y_{out}) and the average luminance value of its neighborhood is increased.

(c) <u>A dark neighborhood</u>. Assume that an area of an image is very dark. In this area, the average luminance value for the pixel neighborhood will be close to zero. C is again set as 1, and, therefore, 1 + C will be 2. In this situation,

$$\gamma = 2^{\left(\frac{Av}{M} - 1\right)}$$

If Av is 0 (*i.e.*, very dark), and if M is again selected to be 128, a value near the middle of the dynamic range, then

$$\gamma = 2^{\left(\frac{0}{128} - 1\right)}$$

or

$$\gamma = 2^{-1}$$

As noted above, a number raised to a negative power is a fraction, whose numerator is 1 and whose denominator is the same number raised to the corresponding positive power. Thus, when γ is 2^{-1}, γ is $\frac{1}{2^1}$ or $\frac{1}{2}$. This gamma $\left(\frac{1}{2}\right)$ is then applied in the formula:

$$Y_{out} = Y_{MAX}\left(\frac{Y_{in}}{Y_{MAX}}\right)^{\gamma}$$

which is,

$$Y_{out} = 255\left(\frac{Y_{in}}{255}\right)^{\gamma}$$

when gamma equals $\frac{1}{2}$,

$$Y_{out} = 255\left(\frac{Y_{in}}{255}\right)^{\frac{1}{2}}$$

See id., 5:47-6:6. Or

$$Y_{out} = 255 \text{ (the square root of } \frac{Y_{in}}{255}\text{)}$$

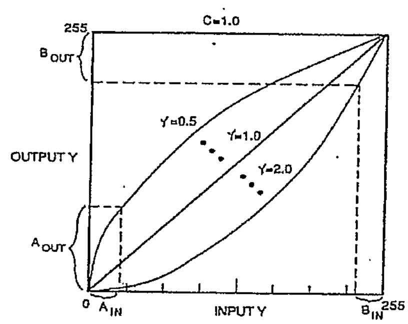
Because the square root of a fraction will always be a larger fraction, Y_{out} will be larger than Y_{in}. The luminance value of Y_{out} will be greater (Y_{out} will be brighter) than the luminance value of Y_{in} and the contrast between Y_{out} and the very low average neighborhood luminance value will be increased.

18. The '381 patent summarizes its teaching as follows (col. 5, ll. 16-29):

> Referring now to FIG. 2, there is shown a graphical representation of the various transfer functions that are imposed by the transfer function circuit 16 as a function of the variation in gamma γ. For the example as shown in FIG. 2, the control parameter C is selected to equal 1 and thus it can be seen that gamma γ has a variation of from 0.5 [in dark areas of an image] to 2 [in bright areas]. For instance, in the situation where the average value of the image defining luminance electronic signals is high [*see* para. 17(b) above] and approaches the maximum value of the dynamic range ... and is indicative of a portion of the image that is extremely bright, it can be seen that ... in the case where $C=1$, gamma $\gamma=2$ as shown in the diagram of FIG. 2.

Figure 2 is reproduced below:

FIG 2



The patent continues:

> The slope of the transfer function, as is readily apparent for the situation where gamma $\gamma=2$, becomes quite steep at the high [bright] end of the dynamic range (B_{In}, B_{out}) thereby providing a higher contrast to those image defining luminance electronic information signals corresponding to pixels having the highest scene light intensity levels. ... Since M is selected to be at the center of the dynamic range, it can be seen that the slope of the transfer function at the center of the dynamic range [*see* para. 17(a) above] most closely approximates that of a straight line thereby providing the least effect on the output signal for pixels having intensity levels near the center of the dynamic range.
>
> Conversely, in the situation where the average values of the image defining luminance electronic information signals are low, approaching 0 indicative of localized areas of low scene light intensity levels [*see* para. 17(c) above], then gamma $\gamma=1$ divided

> by $1 + C$ which equals 0.5 in the case where $C = 1$. ... Thus, the transfer function in this case where gamma γ equals 0.5 operates to transform the image defining luminance electronic information signals to provide a high contrast to those electronic information signals corresponding to pixels having the lowest scene light intensity levels.

Id., 5:29-35, 41-62.

19. The role of C. The '381 patent computes gamma according to the function $\gamma = (1 + C)^{\left(\frac{Av}{M} - 1\right)}$. C is described as a "control parameter which is selected to vary the amount of image enhancement that may be provided by the system." *Id.,* 4:51-55. The larger the value assigned to C, the greater the amount of contrast enhancement. If C is set to be 0, then $(1 + C)$ will be 1. Since 1 raised to any power will always be 1, when C is 0, γ will always be 1:

$$\gamma = (1 + C)^{\left(\frac{Av}{M} - 1\right)}$$

$$\gamma = (1 + 0)^{\left(\frac{Av}{M} - 1\right)}$$

$$\gamma = 1^{\left(\frac{Av}{M} - 1\right)} = 1$$

Thus, when C is 0, no contrast enhancement will occur:

$$Y_{out} = 255\left(\frac{Y_{in}}{255}\right)^{\gamma}$$

$$Y_{out} = 255\left(\frac{Y_{in}}{255}\right)$$

$$Y_{out} = Y_{in}$$

As C increases, the contrast adjusting influence of gamma will increase. For example, if C is set as 1, then

$$\gamma = (1 + 1)^{\left(\frac{Av}{M} - 1\right)} = 2^{\left(\frac{Av}{M} - 1\right)}$$

If $C = 2$, then

$$\gamma = (1+2)^{\left(\frac{Av}{M}-1\right)} = 3^{\left(\frac{Av}{M}-1\right)}$$

For any given *positive* exponent $\left(\frac{Av}{M}-1\right)$, -- *i.e.*, in a bright area of an image -- as the base (1 + C) increases, gamma will become larger ($e.g., 2^2 = 4$; $3^2 = 9$). As gamma becomes larger, contrast enhancement is increased. When a larger gamma is applied in the formula

$$Y_{out} = Y_{MAX}\left(\frac{Y_{in}}{Y_{MAX}}\right)^{\gamma}$$

gamma will be a higher power (*e.g.*, 3 as contrasted with 2). When a larger power is applied to the fraction $\frac{Y_{in}}{Y_{MAX}}$, a lower Y_{out} will result (*e.g.*, $\left(\frac{1}{2}\right)^2 = \frac{1}{4}$; $\left(\frac{1}{2}\right)^3 = \frac{1}{8}$). Thus in a bright neighborhood (a neighborhood that has a high luminance value), as C is made larger, the transformation algorithm of the patent causes the subject pixel to be made less bright by a larger amount. Contrast is greater. The same magnifying function occurs in reverse in dark areas. Thus, variations in C may be used to increase or decrease the degree of contrast enhancement.

20. The role of M. M allows for a different type of adjustment to the contrast enhancement afforded by the algorithm disclosed in the '381 patent. The '381 patent defines gamma as $(1 + C)^{\left(\frac{AV}{M}-1\right)}$. The patent states:

> M may be selected to be any value within the dynamic range of the electronic information signals depending upon where the least image enhancement is desired. Thus, for the case where M is selected to be at the center of the dynamic range [*i.e.*, 128], image enhancement will have the greatest effect near the ends of the dynamic range and the least effect toward the center of the dynamic range. Selecting the value of M to be closer to the high end of the dynamic range will decrease the effective image enhancement provided at that end by the system and method of this invention.

Id., 4:40-51. Thus, when M is selected to be in the middle of the dynamic range, there will be no image enhancement in the middle of the range and an equal amount of contrast enhancement at the two ends of the dynamic range. If M is selected to be a value above the middle (*e.g.*, 175), there will be no contrast enhancement where the average brightness in the pixel neighborhood is 175. There will also be less contrast enhancement in bright areas, than in dark areas, of an image. When M is selected to be lower than the mid-point (*e.g.*, 80), contrast enhancement in bright areas will be greater than contrast enhancement in dark areas.

C. <u>The Prior Art Okada Patent</u>

21. The field of digital image enhancement was well established when Polaroid applied for the '381 patent in 1988. The concepts described in the patent were not new.

22. U.S. Patent No. 4,489,349 (the "Okada patent," Marsden Decl., Ex. C) issued to Takashi Okada on December 18, 1984, almost four years prior to the filing of the application that matured into the '381 patent. The Okada patent describes a way to enhance contrast in images that have very bright or very dark areas. *See* Okada patent, 1:12-36 *and* 2:19-28. Okada states that "natural illumination can have a very wide brightness range and will necessarily have a vast range of contrast scales." *Id.*, 1:13-15. Okada recognized that when a scene contained both very light and very dark areas, contrast within the dark or light sections of an image of that scene "is extremely narrow." *Id.*, 1:31-34. For example, where there was a bright area in an otherwise dark image, contrast within the dark areas would be poor. In such circumstances, the objective, in this example, was to improve contrast in the dark areas. The reverse being true when there was a dark area in an otherwise bright image.

23. Okada discloses a contrast enhancement system in which a signal corresponding to the different parts of an image is supplied as an input to the disclosed contrast enhancement

mechanism and contrast in the light or dark areas is enhanced. *Id.*, 4:11-24, 60-64; Fig. 3. The disclosed contrast enhancement method uses the following transform function in the form:

$$Y_{out} = X^{\gamma}$$

In the Okada formula, X is an input value associated with a part of the original image.[3] Y_{out} is the output of the contrast enhancement system for some portion of the image. X ranges in value from 0 to 1. 0 is black; 1 is very bright; all intermediate values are more than 0 and less than 1. *Id.*, 2:49-55, 5:19-21. Conceptually, this is the same as $\left(\frac{Y_{in}}{255}\right)$ in the algorithm of the '381 patent, which will also always be a value between 0 and 1. In the Okada patent, like the '381 patent, γ is the factor that transforms X into Y_{out}. *See id.,* 2:53-57, 4:16-19.

24. Okada begins by detecting the average brightness or luminance of an image -- the "APL," or average picture level *See id.,* 2:29-57. Values for γ are selected as a function of the difference between this average value and the mid-point of the dynamic range. *See id.,* 5:16-33. Okada explains that it is desirable to have more contrast enhancement in the dark portions of an image when the majority of the image is dark but a portion is very light. In this situation, the APL will be below the mid-point of the dynamic range. *See id.,* 5:22-24, 28-31. Like the '381 patent, the Okada patent teaches that to increase contrast in the dark parts of such an image, γ will be a fractional value, such as 1/2 or 1/3, which will result in contrast enhancement functions represented by curves like curve "a" in Figure 2 above. *See id.*

25. Likewise, like the '381 patent, the Okada patent teaches that when it is desirable to have more contrast in the bright portions of an image, gamma (γ) should be greater than 1,

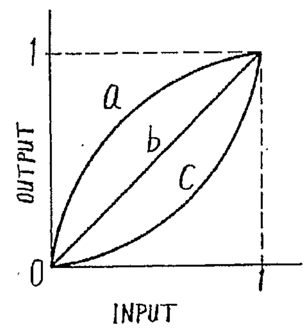
[3] In Okada, X is the brightness of a subpart of the entire image, not the brightness of a single pixel.

which will result in contrast enhancement functions represented by curves like curve "c" in Figure 2, above. *See id.*, 4:20-24.

26. And, like the '381 patent, Okada states that in instances where no special enhancement should occur to light or dark areas, Okada teaches that γ should have a value of 1. A gamma of 1 will result in a transfer function which will apply no contrast enhancement. Such a function is represented by curve "b" in Figure 2. *See id.*, 4:25-29.

27. Okada explains that use of gamma in this way will result in contrast enhancement functions represented in the Okada patent's Fig. 2, set forth below:

FIG. 2



Because the principles underlying Okada and the '381 patent are the same, the curves that represent the input/output characteristics of the transformations described in the two patents are the same. *Compare* '381 patent, Fig. 2 (p. 11, *supra*) with Okada patent, Fig. 2; *see also* p. 38, *infra*, where these graphical representations are presented side-by-side.

D. <u>The Prosecution History of the '381 Patent</u>

28. Not surprisingly, the Okada patent had an influence on prosecution of the application leading to the '381 patent.

29. The application that matured into the '381 patent (Marsden Decl., Ex. D) was filed on April 18, 1988. *See* '381 patent, p. 1. It included means-plus function claims and process claims.

30. All of the original claims were rejected by the Patent and Trademark Office. *See* October 17, 1988 Office Action (Marsden Decl., Ex. E), p. 1. In particular, every independent claim (including the claims that would eventually issue as asserted claims 1 and 7) were rejected as obvious in view of the Okada patent.[4] *See id.,* p. 3. The Examiner noted that "Okada provide[s] a system which attempts to achieve the same results as the applicant." *Id.* The Examiner explained that the Okada patent and the application both

> show an averaging circuit and a correction circuit which use the averaged information to produce an output which follows the slopes of curves shown in Figure 2 of the present invention and Figure 2 of Okada.

Id. He concluded that "[t]herefore, claims 1 [and] 8 [which issued as claim 7] ... would have been obvious in view of Okada." *Id.* However, the Examiner said that claims 3 and 10, among others, "would be allowable if rewritten ... to include all the limitations of the base claim [application claims 1 and 8] and any intervening claims." *Id.*

31. Polaroid did not dispute the Examiner's determination that application claims 1 and 8 were obvious in view of Okada. Instead, Polaroid amended claim 1 so that it included the additional limitation stated in application claim 3 (*see* December 8, 1988 Amendment, Marsden Decl., Ex. F, at pp. 1-2) and amended application claim 8 (issued claim 7) to include the additional limitation contained in application claim 10. *See id.,* pp. 4-5. Application claims 1 and 8 were then allowed (Marsden Decl., Ex. G) and issued as claims 1 and 7 of the '381 patent.

32. Claim 1, as allowed, is set forth below, with the limitation that was added to avoid the Okada patent italicized:

> A system for continuously enhancing electronic image data received in continuous stream of electronic information

[4] All of the dependant claims were rejected under 35 U.S.C. §112, on the grounds that they were indefinite because terms in each lacked appropriate antecedent basis. *See id.,* pp. 1-2.

> signals, each signal having a value within a determinate dynamic range of values and corresponding to one of plurality of succeeding pixels which collectively define an image, said system comprising:
>
> means for averaging electronic information signals corresponding to selected pluralities of pixels and providing an average electronic information signal for each said plurality of pixels so averaged; and
>
> means for selecting one of a plurality of different means for selecting one of a plurality of different transfer functions for the electronic information signal for each of the succeeding pixels in a manner whereby each transfer function is selected as a function of the electronic information signal for one pixel and the average electronic information signal for the select plurality of pixels containing said one pixel and for subsequently transforming the electronic information signal corresponding to each pixel by the transfer function selected for that pixel ***wherein said selecting and transforming means further operates to select said transfer function as a function of the ratio of the value of the average electronic information signal to the dynamic range of the electronic information signals such that the ratio increases in correspondence with the increase in the value of the average electronic information signal.***

33. Claim 7 (application claim 8), as allowed, reads as follows, with the limitation that was added to avoid Okada italicized:

> A method for continuously enhancing electronic image data received in a continuous stream of electronic information signals each signal having a value within a determinate dynamic range of values and corresponding to one of a plurality of succeeding pixels which collectively define an image, said method comprising the steps of:
>
> averaging the electronic information signals corresponding to selected pluralities of pixels and providing an average electronic information signal for each said plurality of pixels;
>
> selecting one of a plurality of different transfer functions for the electronic information signal for each of the plurality of succeeding pixels in a manner whereby each transfer function is selected as a function of the electronic information signal for on pixel and the average electronic information signal for the select plurality of pixels containing said one pixel; and

> transforming the electronic information signal corresponding to each pixel by the transfer function selected for that pixel ***wherein said transfer function is selected further as a function of the ratio of the value of the average electronic information signal to a select proportionate value of the dynamic range of the electronic information signals such that the ratio increases in correspondence with the increase in the value of the average electronic information signal.***

E. **The Accused Software**

34. Polaroid accuses the use of an HP algorithm called "LACE (Local Area Contrast Enhancement) Apply," which is implemented by a small part of vastly larger computer programs. Over time, HP developed different versions of LACE, but the following algorithm is characteristic:

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35.

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36. The accused HP algorithm does not respond to the specific claim limitation that Polaroid added to distinguish the prior art Okada patent and to obtain the allowance of the claims that it now asserts. *Unlike the algorithm of the '381 patent*, the LACE algorithm does not include, and is not calculated based upon, a ratio of any type, much less "a ratio of the value of the average electronic information signal to a select proportionate value of the dynamic range of the electronic information signals such that the ratio increases in correspondence with the increase in the value of the average electronic information signal." '381 patent, claim 7, 9:64-10:2.

F. <u>Polaroid's Infringement Theory</u>

37. Polaroid asserts claims 1-3 and 7-9 of the '381 patent. Claims 1 and 7 are independent claims. Claims 2 and 3 depend from claim 1. Claims 8 and 9 depend from claim 7. As noted above, claims 1 and 7 (and, therefore, all asserted claims) include a "ratio" limitation.

38. Confronted with the undisputed fact that the LACE algorithm does not use a ratio of any type, Polaroid's expert announces that REDACTED

REDACTED Expert Report of Dr. Peggy Agouris Regarding U.S. Patent No. 4,829,381 (Marsden Decl., Ex. H), p. 27. Therefore, Polaroid's expert theorizes.

Id. Polaroid's expert then

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Polaroid then declares that

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39. In sum, HP's actual LACE algorithm does not include a ratio. In an effort to create an infringement argument,

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IV. ARGUMENT

There are several reasons why HP's LACE algorithm does not infringe the asserted claims of the '381 patent. This motion addresses one of them. Summary judgment should be granted because the LACE algorithm does not satisfy the ratio limitation that Polaroid added to

the asserted claims of the '381 patent in order to avoid the Okada reference. And, if the ratio limitation is ignored, Okada is no longer avoided, and summary judgment should be granted for that reason.

A. THE LEGAL STANDARD FOR SUMMARY JUDGMENT

Summary judgment is required where "there is no genuine issue as to any material fact and ... the moving party is entitled to a judgment as a matter of law." Fed. R. Civ. P. 56(c); *see also Business Objects, S.A. v. Microstrategy, Inc.*, 393 F.3d 1366, 1371 (Fed. Cir. 2005). It should be granted "when no reasonable jury could return a verdict for the nonmoving party." *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1307 (Fed. Cir. 1998) (internal quotations and citations omitted). A summary judgment of non-infringement is "appropriate where the patent owner's proof is deficient in meeting an essential part of the legal standard for infringement, because such failure will render all other facts immaterial." *TechSearch, L.L.C. v. Intel Corp.*, 286 F.3d 1360, 1369 (Fed. Cir. 2002). Thus, when an accused system or process lacks a single limitation of a patent claim, summary judgment should be granted as to that claim. *Id.* at 1371.

Claim construction is a question of law for the Court. *Kemco Sales, Inc. v. Control Papers Company, Inc.*, 208 F.3d 1352, 1359-60 (Fed. Cir. 2000). The effect of Polaroid's amendment of the asserted claims during prosecution in an effort to avoid the Okada patent is similarly a question of law. *Business Objects*, 393 F.3d at 1372. The structure of the accused LACE algorithm is a matter of undisputed fact. The fact that the LACE algorithm does not include a ratio is not subject to dispute. The mathematical maneuvers performed by Polaroid are before the Court. This case is ripe for summary judgment.

B. SUMMARY JUDGMENT OF NON-INFRINGEMENT SHOULD BE GRANTED

1. Applicable Legal Principles

The relevant standards are well known. Infringement involves a two-step analysis. The Court first construes the relevant claim. It then compares the accused product or process to the properly construed claim. *Kemco Sales,* 208 F.3d at 1359-60.

There can be no literal infringement unless all of the limitations of an asserted claim are found exactly in the accused product or process. *Cortland Line Company, Inc. v. The Orvis Company, Inc.*, 203 F.3d 1351, 1358 (Fed. Cir. 2000). If a claim limitation is not met exactly, there may be infringement under the doctrine of equivalents, if the difference between the relevant limitation, and the accused product or process is "insubstantial." *Texas Instruments Inc. v. Cypress Semiconductor Corporation,* 90 F.3d 1558, 1563-1564 (Fed. Cir. 1996).

However, where, as here, a patentee narrows its claims by amendment during prosecution to avoid a rejection by the PTO, a specific rule of law applies. The doctrine of prosecution history estoppel prevents the patentee from later asserting that a product or process that would have satisfied the claim as it stood prior to amendment, but does not literally infringe the narrower amended claim, infringes by equivalents. As the Supreme Court said in *Festo Corporation v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd.*, 535 U.S. 722, 733-34 (2002):

> When, however, the patentee originally claimed the subject matter alleged to infringe but then narrowed the claim in response to a rejection, he may not argue that the surrendered territory comprised unforeseen subject matter that should be deemed equivalent to the literal claims of the issued patent.

It is undisputed that Polaroid amended the asserted claims during prosecution. The sequential analysis required in this situation is stated in *Festo Corporation v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd.*, 344 F.3d 1359, 1366 (Fed. Cir. 2003), and set forth below:

The first question in a prosecution history estoppel inquiry is whether an amendment filed in the Patent and Trademark Office ("PTO") has narrowed the literal scope of the claim.

[I]f the accused infringer establishes that the amendment was a narrowing one, then the second question is whether the reason for that amendment was a substantial one relating to patentability. ... [*Id.*]

If ... the court determines that a narrowing amendment has been made for a substantial reason relating to patentability ... then the third question in a prosecution history estoppel analysis addresses the scope of the subject matter surrendered by the narrowing amendment. At that point, [the Supreme Court's decision] *Festo VIII* imposes the presumption that the patentee has surrendered all territory between the original claim limitation and the amended claim limitation. [*Id.* at 1367 (citations omitted).]

The patentee may rebut that presumption of total surrender by demonstrating that it did not surrender the particular equivalent in question. ... [*Id.*]

* * *

The first criterion requires a patentee to show that an alleged equivalent would have been 'unforeseeable at the time of the amendment and thus beyond a fair interpretation of what was surrendered.' ... [*Id.* at 1369.]

The second criterion requires a patentee to demonstrate that 'the rationale underlying the narrowing amendment [bore] no more than a tangential relation to the equivalent in question.' ... [*Id.*]

The third criterion requires a patentee to establish 'some other reason suggesting that the patentee could not reasonably be expected to have described the insubstantial substitute in question.' ... [*Id.* at 1370.]

* * *

[I]f the patentee fails to rebut the *Festo* presumption, then prosecution history estoppel bars the patentee from relying on the doctrine of equivalents for the accused element. [*Id.* at 1367.]

2. Claims 7-9 Are Not Infringed

a. Claim Construction

The parties' alternate claim constructions are stated in their Joint Claim Construction Chart, Dkt. No. 90. Their conflicting constructions of claim 7 of the '381 patent both require the use of an algorithm that includes a specific ratio:

Claim Term	Polaroid's Claim Construction	Hewlett-Packard's Claim Construction
transforming the electronic information signal corresponding to each pixel by the transfer function selected for that pixel *wherein said transfer function is selected further as a function of the ratio of the value of the average electronic information signal to a select proportionate value of the dynamic range of the electronic information signals such that the ratio increases in correspondence with the increase in the value of the average electronic information signal.* [Language added by amendment is emphasized]	"transforming the signal providing pixel information, such as a color, luminance, or chrominance value corresponding to each pixel by the transfer function selected for that pixel wherein said transfer function *is selected further as a function of the* ***ratio*** *of that calculated intermediate value over a value that lies within a range bounded by definite limits such that the ratio increases in correspondence with the increase in the value of the calculated intermediate value*"	each input pixel value that has been part of the averaging step is altered based on the corresponding average electronic information signal to which it is associated and *based on* ***the result of dividing*** *a first existing data value representing the average electronic information signal by a second existing data value representing a select proportionate value of the dynamic range of the average electronic information signals.*

There are multiple claim construction disputes embedded in these alternate constructions, but they share certain common features. Both would require a transfer function that includes a ratio. Both would require that ratio to include (a) a calculated intermediate value -- some kind of average-type value for the group of pixels -- (b) "over" (per Polaroid) or "divided by" (per HP) (c) a value that is one of the values in the dynamic range (*i.e.*, 0, 1, 2 ... 255).

The intrinsic claim construction evidence points to the same conclusion. The plain language of the claim requires a transfer function that is selected "as a function of the ratio" stated in the claim. The body of the '381 patent teaches that the relevant function is:

$$\gamma = (1 + C)^{\left(\frac{Av}{M}\right)-1}$$

The disclosed ratio is $\frac{\text{Av}}{\text{M}}$, where Av is "the average value for the image defining luminance electronic information signal" (4:26-33), and M may be "any value within the dynamic range of the electronic information signals depending upon where the least image enhancement is desired." 4:40-43. No other formula is disclosed. In particular, the '381 patent does not disclose, or suggest, *any* algorithm that lacks a ratio in its exponent.

The prosecution history is even more striking. The ratio limitation was added during prosecution to distinguish the Okada patent. The Okada patent disclosed an algorithm that increased contrast in light or dark areas of an image. The Okada algorithm used a fraction in its base (like the $\frac{Y_{in}}{255}$ of the '381 patent). Okada applied an exponent, γ, to this fraction. The resulting algorithm produced contrast modifications that are identical to those of the '381 patent. However, the Okada patent did not overtly include a ratio in its exponent. As a result, (1) Polaroid's addition of the ratio limitation narrowed the relevant claims of the '381 patent, and (2) purportedly distinguished Okada because, as narrowed, the claims required the ratio that was absent from the Okada disclosure.

As a matter of law, and in view of the parties' alternate constructions which do not dispute this point, claim 7 requires the selection of a transfer function by the use of a ratio of the type stated in claim 7.

b. <u>Literal Infringement</u>

There can be no literal infringement. The LACE algorithm does not include a ratio of any kind. Stated most generously, Polaroid's argument is that the LACE algorithm is only insubstantially different from the algorithm, and that the doctrine of equivalents therefore applies. However, as demonstrated below, the doctrine of equivalents is not available to Polaroid.

c. **Doctrine Of Equivalents**

Claim 7 is set forth in full at pp. 18-19, *supra*. It is a method claim that is directed to a particular way of enhancing electronic images. Prior to amendment, it required, among other things, the steps of

> selecting [a transfer function] for an electronic information signal for each of a plurality of succeeding pixels in a manner whereby each transfer function is selected as a function of the electronic information signal for one pixel and the average electronic information signal for the select plurality of pixels containing said one pixel

and then

> transforming the electronic information signal corresponding to each pixel by the transfer function selected for that pixel.

In order to overcome a rejection based upon the prior art Okada patent, Polaroid narrowed this claim. It added the requirement that

> said transfer function is selected further as a function of the ratio of the value of the average electronic information signal to select proportionate value of the dynamic range of the electronic information signals such that the ratio increases in correspondence with the increase in the value of the average electronic information signal.

This case presents a paradigmatic application of the doctrine of prosecution history estoppel. Assuming away all other claim construction/infringement disputes, the accused LACE algorithm would have infringed claim 7 prior to amendment. It uses a transfer function that is a "function" of the "average electronic information signal for a select plurality of pixels." However, it does not infringe the amended claim because it does not include the required ratio.

It is beyond dispute that Polaroid's amendment narrowed claim 7 by adding the ratio limitation. It is equally clear that the amendment was made for a substantial reason relating to patentability. It was made for the specific purpose of avoiding an obviousness rejection based

upon the Okada patent. Therefore, there is a presumption that Polaroid surrendered all territory between the original and the amended claim.

This is not a case where the alleged equivalent was "unforeseeable." This case involves the use of mathematical formulae. It does not involve previously non-existent technology. The difference between the original and amended claims demonstrates that the "surrendered territory" was not "unforeseen subject matter." *Festo*, 535 U.S. at 733-34. Polaroid might have expressed the relevant limitation more broadly. It chose not to do so. Similarly, this is not a case where the rationale underlying the amendment was no more than tangentially related to the alleged equivalent. There is no ratio disclosed on the face of the Okada patent, just as there is no ratio present in the accused LACE algorithm.

The doctrine of prosecution history estoppel applies. As a matter of law, any contention by Polaroid that any number can be expressed as a ratio, and that, as a result, the LACE algorithm is the equivalent of the claimed algorithm is barred.

d. Polaroid's Ratio Argument Vitiates The Relevant Claim Limitation.

Polaroid's expert, Dr. Agouris, reasons And, she opines,

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If Dr. Agouris' imaginary equation were permitted as a substitute for the actual LACE algorithm, the relevant claim limitation would be rendered meaningless. The theory that every number can be expressed as a ratio deprives the claim term "ratio" of meaning. By Polaroid's lights, any formula that includes any number necessarily includes a ratio. Further,

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[6] In short, the methodology used by Polaroid's Dr. Agouris deprives the relevant claim limitation of all meaning. It must be rejected. *Bicon, Inc. v. The Straumann Company*, 441 F.3d 945 (Fed. Cir. 2006) (noting that plaintiff's proposed construction would "be contrary to the principle that claim language should not [be] treated as meaningless").

Simply put, there can be no factual dispute where an expert simply rewrites the actual equation used by HP, inserting a denominator of her own choosing and selecting an offsetting numerator. The relevant claim limitation expressly requires selection as a function of a specific ratio. The accused algorithm does not do that. If Polaroid wanted to claim an algorithm where "any number" was a ratio, it could have so stated in response to the PTO's rejection in view of the Okada patent. However, to secure allowance, Polaroid inserted a particular ratio. Neither that ratio, nor any other ratio, is present in HP's LACE algorithm.

Claim 7 is not infringed. Therefore, claims 8 and 9, which depend from claim 7, cannot be infringed. *Wahpeton Canvas Co., Inc. v. Frontier, Inc.*, 870 F.2d 1546, 1552 n.9 (Fed. Cir.

[6] In fact,

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Deposition of Dr. Peggy Agouris ("Agouris Dep.") (Marsden Decl., Ex. I), p. 83. Dr. Agouris and Polaroid provide nothing to support the contention that

1989). Summary judgment should be entered dismissing Polaroid's allegation that claims 7-9 of U.S. Patent No. 4,829,381 are infringed.

3. Claims 1-3 Are Not Infringed

a. Principles Applicable To Means Plus Function Claims

The parties agree that claim 1 (and, therefore, dependent claims 2 and 3) are drafted in means plus function form. A court evaluates a means plus function claim by first identifying, and properly construing, the claimed function. It then examines the specification to find the particular disclosed structure that performs that function. *Linear Technology Corp. v. Impala Linear Corp.*, 379 F.3d 1311, 1321-22 (Fed. Cir. 2004). Literal infringement exists if (1) an accused device performs a function that is identical to the claimed function, (2) by the use of a structure that is the same as, or the equivalent of, the disclosed structure. *Kemco Sales,* 208 F.3d at 1364; *Odetics, Inc. v. Storage Technology Corporation*, 185 F.3d 1259, 1267 (Fed. Cir. 1999).

A means plus function claim may be infringed under the doctrine of equivalents if the accused device performs a function that is an equivalent of the claimed function. *Kemco Sales,* 208 F.3d at 1364. However, prosecution history estoppel may preclude the application of the doctrine of equivalents to a means plus function claim, just like any other claim. *See, e.g., Engineered Products Co. v. Donaldson Company, Inc.*, 313 F.Supp. 2d 951, 984-5 (N.D. Iowa 2004).

b. The Unique Language Of Claim 1

As noted above, claim 1 of the '381 patent was amended during prosecution to add a limitation that narrowed the claim so as to overcome a prior art-based rejection. The amendment added a ratio limitation. However, the added ratio limitation in claim 1 is not the same as the corresponding limitation in claim 7.

The claim 7 limitation states:

> A method ... comprising the steps of ... transforming the electronic information signal corresponding to each pixel by the transfer function selected for that pixel wherein said transfer function is selected further as a function of the ratio of the value of the average electronic information signal ***to a select proportionate value of the dynamic range of** the electronic information signals* such that the ratio increases in correspondence with the increase in the value of the average electronic information signal.

(emphasis supplied).

By contrast, the claim 1 limitation recites:

> A system ... comprising ... means for selecting one of a plurality of different transfer functions for the electronic information signal for each of the succeeding pixels in a manner whereby each transfer function is selected as a function of the electronic information signal for one pixel and the average electronic information signal for the select plurality of pixels containing said one pixel and for subsequently transforming the electronic information signal corresponding to each pixel by the transfer function selected for that pixel wherein said selecting and transforming means further operates to select said transfer function as a function of the ratio of the value of the average electronic information signal *to **the dynamic range** of the electronic information signals* such that the ratio increases in correspondence with the increase in the value of the average electronic information signal.

(emphasis supplied).

There is an important difference between these two parallel limitations. Both claim 1 and claim 7 require a ratio that has in its numerator -- *i.e.*, as its first component -- the "average electronic information signal" for a "select plurality of pixels." However, in claim 7, the denominator of the ratio -- the second component of the ratio -- is "a select proportionate value of the dynamic range of the electronic information signals." This language allows the selection of any of the values in the dynamic range -- *i.e.*, in an eight-bit system, any of the integers beginning with 0 and ending with 255. By contrast, in claim 1, the second component of the

ratio is "the dynamic range of the electronic information signals." In an eight-bit system, the dynamic range of the electronic information signals is 256. It is not any number between 0 and 255. '381 patent, 3:46-48. This difference in claim scope is significant, and it may not properly be ignored. *CAE Screenplates, Inc. v. Heinrich Fiedler GMBH & Co., KG,* 224 F.3d 1308, 1317 (Fed. Cir. 2000) ("[i]n the absence of any evidence to the contrary, we must presume that the use of these different terms in the claims connotes different meanings"); *Tandon Corporation v. U.S. Int'l Trade Comm'n*, 831 F.2d 1017, 1023 (Fed. Cir. 1987) ("[t]here is presumed to be a difference in meaning and scope when different words or phrases are used in separate claims.").

c. The Parties' Alternate Claim Constructions

The parties' dueling proposed claim constructions agree that the ratio limitation in the means plus function language of claim 1 describes a *function*, not a means. Both parties' constructions require the use of a ratio. And, both parties' constructions require the use of "the" dynamic range of the electronic information signals" -- *i.e.*, 256 -- as one component of that ratio. Their proposed constructions of the relevant function are set forth below:

Claim Term	Polaroid's Claim Construction	Hewlett-Packard's Claim Construction
means for selecting one of a plurality of different transfer functions for the electronic information signal for each of the succeeding pixels in a manner whereby each transfer function is selected as a function of the electronic information signal for one pixel and the average electronic information signal for the select plurality of pixels containing said one pixel and for subsequently transforming the electronic information signal corresponding to each pixel by the transfer function selected for that pixel wherein said selecting and transforming means further operates to select said transfer function as a function of the ratio of the value of the average electronic information signal to the dynamic range of the electronic information signals such that the ratio increases in correspondence with the increase in the value of the average electronic information signal	The *function* of this means-plus-function element is selecting one of a plurality of different transfer functions for the electronic information signal for each of the succeeding pixels and for subsequently transforming the electronic information signal corresponding to each pixel by the transfer function selected for that pixel wherein said selecting and transforming means further operates to select said transfer function as a function of *the ratio of the value of the average electronic information signal to the dynamic range of the electronic information signals* such that the ratio increases in correspondence with the increase in the value of the average electronic information signal.	*Function*: selecting a transfer function for each incoming pixel based on the pixel value and its corresponding average electronic information signal, and *based on the result of dividing a first existing data value representing the average electronic information signal by a second existing data value representing the dynamic range of the average electronic information signals.*

d. HP Does Not Infringe This Means Plus Function Claim

On the undisputed evidence, claim 1 of the '381 patent is not infringed. The function portion of this limitation is not satisfied for each of the following reasons:

First, for the reasons stated above, the LACE Apply algorithm does not perform the claimed function of selecting a transfer function as a function of ratio -- any ratio.

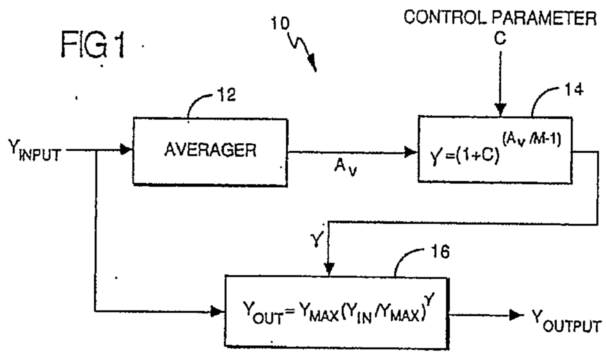
Second, if Polaroid were to claim the accused algorithm performs an equivalent function, any such assertion would be barred by the doctrine of prosecution history estoppel. Polaroid added this limitation to the claimed function in order to avoid the prior art and to overcome a rejection by the PTO. The added limitation narrowed the claimed function. The narrowing amendment was made for a substantial reason relating to patentability. Therefore, Polaroid is precluded from asserting the doctrine of equivalents.

Third, even after inserting a ratio into the LACE algorithm and then declaring that it finds a ratio in the LACE algorithm, and even after the mathematical manipulations that it uses to cause its modification of LACE to look like the algorithm disclosed in the '381 patent, Polaroid does not identify any ratio in which the denominator (the second value) is 256 -- "[t]he dynamic range of the electronic information signals." Any assertion that the use of some other number in the claimed ratio is the functional equivalent of the use of 256 is barred by prosecution history estoppel.

In addition, HP does not use a structure that is the same as, or the equivalent of, the structure disclosed in the '381 patent.

Claim 1 recites "a system for continuously enhancing electronic image data ...." Figure 1 of the patent provides a conceptual diagram of the system. It shows the relationship of the parts of the disclosed system. It is reproduced below:

FIG 1



At a conceptual level, the system includes (a) an averager (12) whose function is to average the luminance values of a group of pixels, including, and in the neighborhood of, the pixel of interest (*id.*, 3:59-61), (b) a gamma determining circuit (14) whose role is to determine gamma (*id.*, 4:26-33), and (c) a transfer function imposing circuit (16) whose task is "to impose [a particular transfer function] on the image defining luminance information signals (Y)." *Id.*, 4:56-59.

Figure 4 then shows "in substantially more detail a system for enhancing electronic image data of this invention in the manner of Fig. 1." *Id.*, 2:48-50. Fig. 4 is reproduced below:

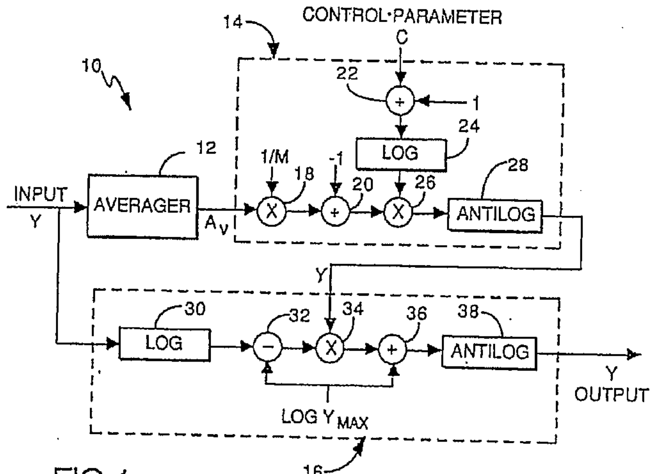


FIG 4

Beginning at 6:43, and continuing to 7:27, there is a detailed description of the apparatus that is the part of the claimed "system" and "implements" the algorithm that is also described in the patent. This structure consists of a particular combination of circuits, ordered and combined in a particular way. At the conclusion of its description of the disclosed means, the patent states:

> Thus, in this manner, gamma γ is determined continuously in accordance with the relationship as shown by the block diagram of FIG. 1 in a simple and convenient manner utilizing multiplication circuits, combining circuits, logarithm determining circuits, and antilogarithm determining circuits as shown in FIG. 4. In like manner, the transfer function continuously varied in accordance with the selection of gamma may also be imposed continuously in a simple and convenient manner by circuitry comprising a logarithm determining circuit, combining circuits, multiplication circuit, and an antilogarithm determining circuit.

Id., 7:27-42.

Polaroid argues that the "structure" that constitutes the means of claim 1 is the algorithm described in the specification. However, an algorithm is not a structure; it is a concept. It must be implemented by a structure that uses the algorithm. The structure disclosed in the '381 patent

is the physical apparatus that is described at length in the specification and depicted in Fig. 4. It is undisputed that HP does not use an apparatus of this type.

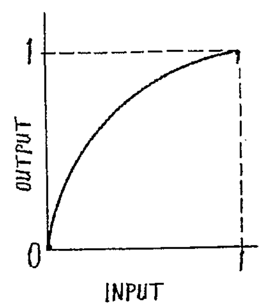
This is a claim construction dispute. Where, as here, a patent discloses a specific structure, the scope of a means plus function claim is limited to that structure and its equivalents. *See Ballard Medical Products v. Allegiance Healthcare Corp.*, 268 F.3d 1352, 1361 (Fed. Cir. 2001) (rejecting plaintiff's contention that the relevant patents apply to any valve structure that minimizes the certain cross-contamination because "that functional characterization of the scope of the claims is inconsistent with the statutory provision that limits means-plus-function claims to the disclosed structure and equivalents, rather than covering any structure that performs the recited function"); *Signtech USA, Ltd. v. Vutek, Inc.*, 174 F.3d 1352, 1357 (Fed. Cir. 1999) ("[b]y choosing means-plus-function language ... the patentee necessarily restricted the scope of this element to the structure disclosed in the specification and its equivalents"); *Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206, 1212-13 (Fed. Cir. 1998) (finding that accused product was not a structural equivalent where the specification disclosed a "solenoid" to perform the specified function, and the accused product used a "stepper motor" instead of a "solenoid"); *Faroudja Laboratories, Inc. v. Dwin Electronics, Inc.*, 76 F.Supp. 2d 999, 1012 (N.D. Cal. 1999) (the structure was "not just any 'field comparator' but rather the specific field comparator disclosed in Figure 3").

Polaroid chose to claim using means plus function language. It cannot now escape the limitations imposed by law on the proper scope of means plus function claims. The LACE algorithm is not "structure." Even if the LACE algorithm alone, or together with a computer, were to perform the same function as is recited in claim 1 of the '381 patent (*but see* pp 33-34 above), there is no structure that is the same as, or an equivalent of, the structure disclosed in the patent.

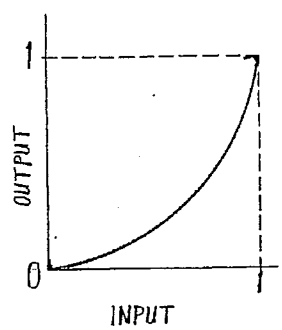
For each of the reasons stated above, claim 1 is not infringed. Therefore, dependent claims 2 and 3 cannot be infringed. Summary judgment of non-infringement should be granted.

C. <u>If The Asserted Claims Of The '381 Patent Are Construed So As To Cover The Accused Products And Process, They Are Invalid Because They Are Obvious In View Of The Okada Patent.</u>

The Okada patent discloses a function that operates in the same way as the system and process claimed in the '381 patent. It describes a system in which an input brightness value is modified by the use of an exponent, which it calls gamma. The input information signal is an average brightness value. This value is expressed as a number between 0 and 1. The input value is transformed using an exponent that is a fraction if contrast is to be increased in the dark portion of an image, and an amount in excess of 1 if contrast is to be increased in the bright portion of an image. If the exponent is a fraction, the Okada patent produces a set of transforms that may be depicted as

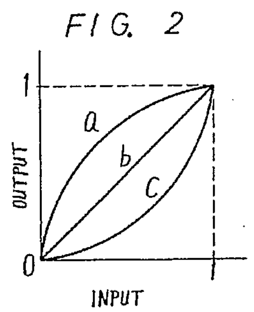


If the exponent is a value greater than one, it will produce a set of transforms that may be depicted as

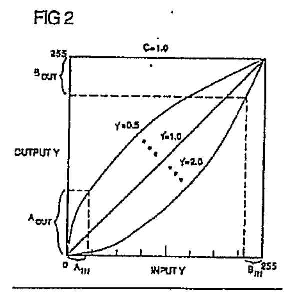


Because the Okada patent and the '381 patent disclose the same idea, when Okada and the '381 patent depict the functions selected by their respective algorithms, those depictions are virtually identical.

Okada Patent Fig. 2



'381 Patent Fig. 2



The PTO rejected the originally-filed claims of the application for the '381 patent as obvious in view of Okada. Rather than contest that fact, Polaroid added a limitation that required that a transfer function be selected as a function of a particular ratio. No such ratio was apparent on the face Okada -- just as no such ratio is present in the accused LACE algorithm. However, if Polaroid's thesis that any number can be expressed as a combination of other numbers were to be accepted, and if a ratio can be discovered by substituting a ratio into an exponent in lieu of a factor that is actually in the exponent, then the same type of manipulation of numbers can be performed on the Okada patent that Polaroid performs on HP's ratio-less algorithm.[7]

[7] For example, using Dr. Agouris' theories,

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Apparently, for this reason, and in an effort to be consistent, Polaroid concedes that the Okada reference discloses the selection of a transfer function "as a function of the ratio of the value of an average electronic information signal to a select proportionate value of the dynamic range of the electronic information signals." In her expert report, Polaroid's expert, Dr. Agouris, states that:

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Rebuttal Expert Report of Dr. Peggy Agouris Regarding U.S. Patent No. 4,829,381 ("Agouris Rebuttal") (Marsden Decl., Ex. J), pp. 31-32.

Polaroid is hoist by its own petard. Polaroid now admits that the limitation it added during prosecution to avoid the Okada patent is actually found in Okada. According to Polaroid (and as compelled by the infringement theory that Polaroid asserts against HP), that limitation does not (and cannot) distinguish Okada in any way. Therefore, on Polaroid's theory, and in view of Polaroid's admissions, the asserted claims of the '381 patent are invalid.

V. <u>CONCLUSION</u>

Summary judgment exists for cases like this. HP does not infringe. And, if HP were deemed to infringe, the asserted claims would be invalid in view of the Okada patent. This case should be dismissed.

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Dated: May 16, 2008

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CERTIFICATE OF SERVICE

I hereby certify that on May 16, 2008, I electronically filed with the Clerk of Court the foregoing document using CM/ECF which will send electronic notification of such filing(s) to the following counsel:

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